Message

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Sent: 10/6/2017 2:18:30 PM
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Subject: GE News & Science

It's back! After two months of frequent travel and competing demands, I hope to continue sending Friday reports on a regular basis.

NEWS

In August, FDA approved the first gene therapy treatment in the US

- The treatment, called Kymriah, involves removing T cells from leukemia patients and engineering them to attack cancer cells

Science: Modified T cells that attack leukemia become first gene therapy approved in the United States

Syngenta settles with farmers for $1.5B, but grain traders still seeking damages

- Farmers and grain traders have sought compensation from Syngenta for a drop in corn price after China stopped importing US corn, because it discovered Syngenta's not-yet-approved Agrisure Viptera trait in US exports
- Before the settlement, Syngenta faced state-by-state class action lawsuits from farmers
- Trial for the Cargill and ADM suit is set to begin in September 2018

Reuters: ADM, Cargill still pursue Syngenta over China GMO corn rejections

GE fish quietly entered the market in Canada

- *CBC* reported that AquaBounty has already sold 5 tons of GE salmon in Canada without widespread public awareness
- Many major supermarket chains in Canada say they do not carry it, including Costco

CBC: Would you eat genetically modified fish? You may have already

***New York Times* features Impossible Burger's interactions with FDA over recombinant soy leghemoglobin**

- The soy protein, produced in recombinant yeast, mimics blood and gives the plant-based burger a more realistic appearance and taste
- The company used the FDA's generally recognized as safe (GRAS) notification program for food ingredients
- Advocacy groups obtained FDA documents on the company's initial submission to the agency through Freedom of Information requests
- The *Times* reports that FDA identified some shortcomings in the initial submission, and the company plans to resubmit an improved notice

New York Times: Impossible Burger's 'Secret Sauce' Highlights Challenges of Food Tech

Feature in *Reuters* blames seed-driven improvements in productivity for grain surpluses and low prices

- The article discusses Monsanto's effort to breed early-maturing corn to enable production in higher latitudes
- "Some analysts say the firms have effectively innovated their way into a stubbornly oversupplied market."
- Low prices are thought to be driving the ongoing consolidation in the agriculture sector
- The current glut is also attributed to a food shortage and price spike in 2008, which prompted more farmers around the world to grow corn

Reuters: Special Report: Drowning in grain - How Big Ag sowed seeds of a profit-slashing glut

***New York Times* features problems from herbicide drift related to dicamba tolerant, GE crops**

- The article includes little new information
- Dicamba sprayed on tolerant crops is prone to drifting and damaging non-tolerant fields
- As a result, multiple states have taken steps to restrict use of dicamba
- Dicamba tolerant cotton and soy were planted on 25M acres this year

New York Times: Monsanto's weed killer, dicamba, divides farmers

FDA publishes final guidance on FDA vs EPA oversight of mosquito-related products

- Mosquito products, including GE mosquitos, intended to function as pesticides will be regulated by EPA, whereas those meant to prevent disease will be regulated by FDA
- The Oxitec GE mosquito will now be handled by EPA

FDA: Clarification of FDA and EPA Jurisdiction Over Mosquito-Related Products
ABC News (AP): Officials: GMO mosquitoes aren't 'drugs,' need EPA oversight

Genome-edited camelina not regulated by USDA

- The camelina reportedly yields more oil to improve the crop's commercial viability
- The company Yield10 imparted the trait using CRISPR/Cas9

USDA/APHIS: Genome Edited Camelina Developed by CRISPR/Cas Technology
Capital Press: Gene-edited camelina cleared by USDA

Genome-edited alfalfa not regulated by USDA

- The alfalfa was developed using TALEN technology for improved nutritional quality

USDA/APHIS: Alfalfa with Improved Nutritional Quality Developed with TALEN Technology

Study completed on use of digital codes for GE food disclosure

- The study, conducted by Deloitte, was commissioned as part of USDA/AMS' efforts issue a regulation enacting GE food disclosure within a two-year period ending in July 2018
- The study found "significant, but manageable" challenges in the use of electronic codes

Food Navigator: Digital GMO disclosure faces significant but manageable challenges, USDA study

The Grocery Manufacturers Association (GMA) wants highly refined ingredients to be within the scope of USDA-enforced GE food disclosure requirements

- GMA's position applies to oils, sugar, sweeteners, and other highly refined ingredients derived from various GE crops that lack detectable GE material
- GMA cites consumer interest and transparency as motivators for its position

Food Navigator: GMA: GMO labeling should apply to high refined oils, sweeteners

COMMENTARY

Broad coalition of stakeholders, including US regulators, summarize outcome of January 2016 meeting on gene drives in insects

- The authors aimed to develop guidelines for use of gene drives in insects
- The authors emphasized the need for complementary "self-governance," "soft governance," and "federal governance"

Nature Biotechnology: Rules of the road for insect gene drive research and testing
Official Report: Policy and Regulatory Issues for Gene Drives in Insects

Market analysist sees great value in GE crops with omega-3 oils, but thinks fermentation could ultimately outcompete GE crops

- The analyst thinks industrial fermentation will ultimately be the cheapest, most flexible way to replace fish oil for uses in aquaculture and dietary supplements
- Seed companies, grain traders, and other biotechnology companies are investing heavily in both GE plants and in microbes for omega-3 production

The Motley Fool: Why GMO Crops (Probably) Can't Compete for This $22 Billion Ingredient Opportunity

NYU Medical School ethicists consider how and to what extent communities should decide on use of GE insects

- The authors use the GE diamondback moth and Oxitec's GE mosquito as case studies
- The authors conclude by emphasizing the need for pro-active community engagement

Nature Biotechnology: Ethical lessons from a tale of two genetically modified insects

Morten Hedegaard Larsen of Aahrus University responds to Richard Flavell of Ceres, Inc.'s case for wider use of plant biotechnology

- Larsen thinks Flavell misses key points in his case that using plant biotechnology to improve lives is a moral imperative and that scrutiny of biotechnology should be strictly product-based
- Larsen thinks Flavell overstates his case for biotechnology by failing to emphasize food waste, and underestimates the need for transparency and the value of fostering societal buy-in
- Flavell responds to Larsen by reasserting the logic of product-based scrutiny

Nature Biotechnology (Flavell): Reply: Greener revolutions for all require transparency and diversity, not secrecy
Nature Biotechnology (Larsen): Greener revolutions for all require transparency and diversity, not secrecy
Nature Biotechnology (Flavell, original): Greener revolutions for all

SCIENCE

Scientist use CRISPR-Cas9 to repair genetic defect in human embryos

- The study received a high level of media attention when it was published August 2nd, but *Science* published doubts about the work August 31st related to potential artifacts
- The CRISPR/Cas9 protein complex was microinjected into cells coordinated at S-phase to maximize efficiency
- Loci were corrected by homology-directed repair using the endogenous wild type allele as the template
- The project was a collaboration between scientists at the Salk Institute, Oregon Health & Science University, Seoul National University, and BGI in China

Nature: Correction of a pathogenic gene mutation in human embryos
Nature (news): At the heart of gene edits in human embryos
New York Times: In breakthrough, scientists edit a dangerous mutation from genes in human embryos
Science: Skepticism surfaces over CRISPR human embryo editing claims

CRISPR-Cas9 used to develop genome-edited pigs entirely lacking porcine endogenous retroviruses (PERVs) for xenotransplantation

- The group, led by George Church, Luhan Yang, and the startup eGenesis, hopes to modify pigs to allow transplantation of organs to humans
- The study also confirmed that PERVs can infect and transfer to human cells, making it essential to remove all PERVs before xenotransplantation
- A 2015 study showed PERVs could be removed from a pig immortalized cell line, whereas this work removed all PERVs and generated whole pigs
- eGenesis announced it raised $38M in startup funds in March 2017

Science: Inactivation of porcine endogenous retrovirus in pigs using CRISPR-Cas9

Genetically engineered malaria resistance in mosquitoes has incidental gene drive characteristics

- The GE insects have changes in their microbiota and altered mating behaviors that promote the spread of the GE alleles in a population

Science: Changes in the microbiota cause genetically modified Anopheles to spread in a population
Washington Post: Genetically modified approaches to fighting malaria succeed in new tests

GE mosquito gut bacteria confer resistance to malaria and are inherited by subsequent generations

- While GE gut bacteria had already been engineered that could confer malaria resistance to mosquitoes, the bacteria were not passed on to future generations
- This bacterium inhabits mosquito ovaries and can spread to subsequent generations
- The bacteria secrete anti-malaria effector proteins

Science: Driving mosquito refractoriness to Plasmodium falciparum with engineered symbiotic bacteria
Washington Post: Genetically modified approaches to fighting malaria succeed in new tests

CRISPR-Cas9 used to create genetic diversity in important yield-related traits in tomato

- The approach involved using CRISPR-Cas9 to generate an array of random mutations in the promoters of key yield genes
- After the CRISPR-Cas9 transgene was segregated away, the researchers could then characterize the mutations and traits
- The researchers hope this technique can help generate valuable genetic diversity in key traits in elite lines of additional crops

Cell: Engineering Quantitative Trait Variation for Crop Improvement by Genome Editing
Phys.org: Plant geneticists develop a new application of CRISPR to break yield barriers in crops

DuPont-Pioneer's "Plenish" high-oleic soybean associated with decreased obesity in mice

- High oleic soybean oil was compared to conventional soybean oil, coconut oil, and a low-fat diet
- The study examined proteins in livers

Scientific Reports: Omega-6 and omega-3 oxylipins are implicated in soybean oil-induced obesity in mice
GEN: GMO-Sourced Soybean Oil Causes Less Obesity than Conventional Oil

Low-gliadin wheat developed using CRISPR/Cas to make wheat safe for celiac patients

- One line had mutations in 35 out of 45 gliadin loci and had 85% lower immunoreactivity

Plant Biotechnology Journal: Low-gluten, non-transgenic wheat engineered with CRISPR/Cas9
Quartz: Scientists are close to creating a strain of GMO wheat without gluten

Sugarcane edited using TALENs for improved saccharaficiation efficiency

- The TALENs created mutations in 107 of the 109 COMT alleles

Plant Biotechnology Journal: TALEN mediated targeted mutagenesis of more than 100 COMT copies/alleles in highly polyploid sugarcane improves saccharification efficiency without compromising biomass yield

Wayne Parrott and Monsanto scientists explain how seed companies vet new plant varieties
Crop Science: Bringing New Plant Varieties to Market: Plant Breeding and Selection Practices Advance Beneficial Characteristics while Minimizing Unintended Changes

Wayne Parrot and Miguel Sánchez refute studies cited in arguments against safety of GE food
Plant Biotechnology Journal: Characterization of scientific studies usually cited as evidence of adverse effects of GM food/feed

Bt tomato developed with resistance to tomato leaf miner

- The tomato was developed in Turkey and expresses Cry1Ac

Plant Cell, Tissue and Organ Culture: Cry1Ac-mediated resistance to tomato leaf miner (Tuta absoluta) in tomato

Rice expressing ion transporters from Jerusalem Artichoke have improved tolerance to salinity and nutrient stress

- The engineered rice plants had improved yield in field trials under K-limited salt-stress or nutrient deficient conditions

Plant Biotechnology Journal: Two NHX-type transporters from Helianthus tuberosus improve the tolerance of rice to salinity and nutrient deficiency stress

Lettuce engineered for resistance to whitefly using RNAi

- The dsRNA target's a whitefly *v-ATPase* gene
- The lettuce was developed by Embrapa in Brazil

Transgenic Research: RNAi-mediated resistance to whitefly (*Bemisia tabaci*) in genetically engineered lettuce (*Lactuca sativa*)

Apple engineered for drought tolerance

- The apples express endogenous *ATG18a*, which modulates the cellular process known as autophagy

Plant Biotechnology Journal: Improvement of drought tolerance by overexpressing MdATG18a is mediated by modified antioxidant system and activated autophagy in transgenic apple

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This report is a summary of third-party news, opinion, and scientific literature and is not meant to reflect views of the author or of the U.S. Food & Drug Administration.

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